

to the earth, when it entirely demolished a dwelling and a cotton house, scattering and carrying their contents great distances. Various articles of clothing were seen whirling through the air. Its track was narrow and about eight miles in length.

VERIFICATIONS.

Indications.—The detailed comparison of the tri-daily indications for November, with the telegraphic reports for the succeeding twenty-four hours, shows the general percentage of verifications to be 86.02 per cent. The percentages for the four elements are: Weather, 88.25; Direction of the Wind, 81.96; Temperature, 87.71; Barometer, 86.03 per cent. By geographical districts they are: For New England, 87.3; Middle Atlantic states, 88.4; South Atlantic states, 89.8; Eastern Gulf states, 85.4; Western Gulf states, 86.2; Lower Lake region, 85.3; Upper Lake region, 84.6; Tennessee and the Ohio valley, 86.8; Upper Mississippi valley, 86.4; Lower Missouri valley, 80.6; Northern Pacific coast region, 65.9; Central Pacific coast region, 86.6; Southern Pacific coast region, 93.5. There were 78 omissions to predict out of 3,690, or 2.00 per cent. Of the 3,612 predictions that have been made, 130, or 3.60 per cent. are considered to have entirely failed; 117, or 3.24 per cent. were one-fourth verified; 367, or 10.16 per cent. were one-half verified; 414, or 11.46 per cent. were three-fourths verified; 2,584, or 71.54 per cent. were fully verified, so far as can be ascertained from the tri-daily reports.

Cautionary Signals.—221 Cautionary signals were displayed during the month of November, 1881, of which 199, or 90.09 per cent., were fully justified by winds of twenty-five miles per hour, or over, at, or within, a radius of 100 miles of the station. Sixty-seven Off-shore signals were displayed, of which 51, or 76.12 per cent., were fully justified; 53 or 79.10 per cent., were justified as to direction; 61, or 91.05 per cent., were justified as to velocity, and 4, or 5.97 per cent., completely failed. Twenty-one Off-shore signals were changed from Cautionary. Two Northwest signals were displayed, both of which were fully justified. 290 signals, of all kinds, were displayed, of which 252, or 86.89 per cent., were fully justified. The above does not include signals ordered at 67 display stations, where the velocity is only estimated. 149 winds, of 25 miles, or over, were reported, for which no signals were ordered. 49 signals were ordered late.

NAVIGATION.

Stage of Water in Rivers.—In the table on the right-hand side of chart No. III are given the highest and lowest stages of water as observed at Signal Service stations during the month of November, 1881. The water in the Missouri river has remained at a very low stage throughout the month being at all stations, even on the date of highest water, from 10 to 18 feet below the danger-line. In the Mississippi, there has been a moderately high stage from St. Paul to Dubuque; at Davenport and Keokuk the water has been from 1 to 5 feet above the danger-line; at St. Louis within 6 inches of the danger-line, and from Cairo to New Orleans all stations remained from 4 to 8 feet below the danger-line. In the Ohio, Cumberland, Tennessee and Monongahela rivers the water remained quite low throughout the month, the highest being at Pittsburg where it reached within 8 feet of the danger-line. In the Red, Arkansas, Savannah and Sacramento rivers, no changes of importance took place; water quite low throughout the month.

Ice in Rivers and Harbors.—*Saginaw River:* East Saginaw, 25th, ice forming rapidly and people reported crossing on the ice at Zilwaukee. Bay City, 24th, ice formed during the night and on the following day river full of broken cakes of ice. *Dakota River:* Morriston, Dak., 14th, river frozen over. *Embarrass River:* Embarrass, Wis., 28th, river frozen over. *Manitowoc River:* Manitowoc, Wis., 20th, river frozen over. *Lake Huron:* Port Huron, 25th, schooner "A. J. Rogers," just in port from Thunder Bay, is badly iced up. Schooner "Emerald," from Presque Isle, 25th, vessel covered with a perfect coat of ice, everything on decks frozen solid. *Mississippi River:* Red Wing, Minn., 18th, large quantities of floating ice between St. Paul and Lake Pepin; steamer "Imperial" was from 4 p. m. of the 18th, until noon of the 22d, in making a distance of 60 miles. La Crosse, 15th, floating ice in river, first of season; 28th, ice broke up in river. Davenport, 10th, although no ice has yet appeared in the river, the weather has been so cold that navigation is now considered closed for the season. St. Paul, 15th, 17th, 24th, floating ice in river, 18th, river frozen along the banks. Steamer "Arkansas" left port; the last boat of season. 20th, river frozen along the banks; channel full of ice; navigation practically closed for the season. River has been open from April 7th to November 20th, a period of 227 days. The greatest depth of water (19 feet 8 inches) occurred April 29th; lowest (3 feet 4 inches) occurred September 14th and 15th, giving a range for the season of 11 feet 5 inches; average depth, 11 feet 5 inches. 22d, ice gorged in river below city. 23d, gorge broke during morning. *Milwaukee River:* Milwaukee, 20th, river frozen over. *Red River of the North:* Moorehead, Minn., 15th, river frozen over. St. Vincent, Minn., 13th, river frozen. Winnipeg, 18th, river frozen over, but not strong enough to permit crossing. *Tongue River:* Ft. Keogh, Mont., 18th, river frozen over. *Missouri River:* Bismarck, 18th, river frozen over and teams crossing. Yankton, 18th, river frozen over. Ft. Buford, 17th, river frozen over. Ft. Sully, Dak., 15th, ice floating in river.

Ft. Hale, Dak., 17th, river closed. Morriston, Dak., 14th, river closed. *St. Croix River*: St. Croix, 18th, river frozen over, navigation closed. *Assinaboine River*: Winipeg, 17th, river frozen over sufficiently strong to bear up crossing teams. *Chippewa River*: Chippewa City, 17th, both steamboat and raft navigation suspended; river full of floating ice. *Stillwater Lake*: Stillwater, Minn., 17th, lake froze over during the night. *St. John's River*: St. John, New Brunswick, 23d, ice forming rapidly, navigation closed. *Maumee River*: Toledo, 25th, river frozen over. *Walkill River*: Montgomery, N. Y., 25th, river nearly frozen over. *Rock River*: Rockford, Ill., 24th, river frozen over; 29th, river clear of ice. *Erie Canal*: Rochester, 26th, light floating ice. Syracuse, 26th, ice thawing quite rapidly.

Floods.—*Illinois*: Springfield, 22d, Sangamon river overflowed; all bottom lands flooded; loss to the corn crop in this vicinity estimated at \$250,000. Riverton, 22d, terrible devastation by the flood; many fields of corn covered with water; water over wagon roads four feet deep in many places; cattle pens partially submerged. Alcohol Walk, 22d, 200 cattle and 1,300 hogs driven out of the cattle pens owing to high water; considerable loss to animal life; paper mill suspended operations and threatened with overflow; one farmer lost 2,000 bushels of corn and many others smaller quantities. Rushing River, 18th, exceedingly heavy rains; streams flooded and much damage caused to farm property. Carrollton, 17th, Apple and Macoupin creeks higher than ever before known; many bridges carried away and much other damage done. Decatur, 18th, a violent rain storm has prevailed for the past 36 hours without cessation; farmers report the whole country under water; several bridges and over 80,000 feet of lumber carried away. Marshall, 18th, heavy rains for past two days causing considerable damage to railroad beds and trestles; on the Cairo division of the Wabash R. R., all traffic delayed. Hillsboro, 18th, terrific storm of rain accompanied by the heaviest flood known for many years; bridges washed away and a great amount of farm property destroyed; all trains delayed by serious washouts. Clinton, 18th, very heavy floods; much damage to bridges and farm property. St. Francisville, 18th, railroad bridge washed away and all travel interrupted. Alton, 18th, Wood river overflowed; hundreds of acres on either side under water; all railroad bridges across the river have been swept away or made so dangerous that travel is completely checked. Charleston, 18th, creeks higher than they have been since 1875. 21st, Embarrass river higher than it has been at any time since 1875. *Indiana*: Indianapolis, 18th, reports from the middle and southern portions of the state show great damage by heavy floods, consequent upon the recent incessant rains. White river has risen 12 feet, and, at this date, is rising at the rate of one foot per hour; water within four feet of the great rise of 1874. Two creeks passing through the city overflowed, causing great damage to private property; on some streets the water was deep enough to swim a horse. All railroads seriously affected by the floods. Vincennes, 18th, heavy and incessant rains for the past three days; Wabash river overflowed. Lafayette, 18th, Wabash river and tributaries rising rapidly; bottom lands completely submerged. Dayton, 18th, Wild Cat creek overflowed, carrying away railroad bridge, and causing other serious damage. Muncie, 18th, heavy rains for past three days bridges carried away. Eaton, 18th, creeks overflowed, and railroad bridge washed away; all travel suspended. *Missouri*: St. Louis, East Side, 19th, low lands submerged, in some localities hundreds of acres completely under water, varying from 6 to 18 inches in depth; Cahokia creek overflowed, and between the Stock Yards and Venice bottom lands flooded; several serious washouts on the Indianapolis and St. Louis R. R. The rain-fall accompanying this storm of the 17th and 18th was the heaviest in this portion of Missouri for the month of November during the past ten or fifteen years. The destruction to railroad and farm property has been enormous. The rapid rise in the waters of the Missouri for this month of the year, has never before been experienced in the history of Missouri floods. Railroad and telegraphic communication generally suspended. Washington, 18th, heavy rains and serious washouts on railroads; much damage to farm property. Gasconade, 18th, all trains delayed and much damage caused by the floods. Hermann, 18th, heavy washouts on the Missouri Pacific R. R.; all travel suspended. New Haven, 18th, two miles east of station railroad bridge carried away; road-bed for several miles badly washed. *Ohio*: Coshocton, 18th, extraordinary rains during the past 48 hours, causing an immense amount of damage in this section of the country. All streams in this vicinity have overflowed their banks. The Tuscarawas, Walhounding and Muskingum rivers have risen over ten feet in the past ten hours and still rising at the same rate. Hay, corn, wheat, straw and fences along the creek and river bottoms have been carried away by the heavy flood. *Texas*: Brackettville, 12th, most disastrous floods along the Rio Grande river that have occurred in the past 30 years; rain has fallen almost daily since the 13th of September. Brownsville, 11th, Rio Grande river higher than at any time since 1848. Matamoras, 11th, about three-fourths of the town under water, great damage to property and much suffering among the poorer classes. *Wisconsin*: Beloit, 4th, Rock river much swollen; 30 feet of dam gave way, causing suspension of work in mills.

Waterspouts.—Life Saving Station, No. 6, N. C., 5th, 9.30 a. m.; a well defined waterspout was observed off Fresh Pond Hill, three miles south of station. Its trunk proceeded from the base of a dense cumulo-stratus cloud to the water's surface. It moved gradually with a swaying whirl-

ing motion towards a point slightly north of east and was accompanied by a sound similar to that produced by the wind in passing through a pine forest. Its mean height was about fifteen feet; color similar to that of the surrounding clouds, a dark leaden hue. No peculiar conditions of the surrounding atmosphere were apparent during its existence. Phenomenon lasted forty-five minutes.

High Tides.—Punta Rassa, Fla., 23d, very high; water over one foot deep under office building.

TEMPERATURE OF WATER.

The temperature of water, as observed in rivers and harbors at Signal Service stations, with the average depth at which observations were taken, is given in the table on the left-hand side of chart No. III. Owing to breakage of instrument, observations at Marquette were discontinued from the 14th to the 26th, inclusive. The report from Chincoteague failed to appear in time for publication.

ATMOSPHERIC ELECTRICITY.

Auroras.—The most important display that occurred during the month was that of the 23d which was reported by numerous intervening stations from Osewego westward to Helena, Mont. and southward to Ft. Madison, Ia. At many of the stations reporting, the display was brilliant, beginning early in the evening and lasting until after midnight. The display of the 9th was observed at the following stations: Ft. Bennett, 4 a. m.; Huron, Dak., 5 a. m.; La Crosse, early morning; Clinton, Ia., 1.30 a. m.; Dubuque, 12.30 to 2.30 a. m.; Riley, Ill., 4.10 a. m.; Springfield, Ill., 5.30 a. m.; Milwaukee, early morning. The following stations report the display of the 17th: Clear Creek, Neb.; St. Vincent, Minn. and New Corydon, Ind. The display of the 26th was reported from Ft. Shaw, Mont., Deadwood, Dak., and Northfield, Minn. Other displays have been reported from the following stations: Ft. Shaw, Mont., 22d, from 8 to 11 p. m.; Deadwood, Dak., 27th, 9 p. m.; St. Vincent, Minn., 20th, 7 p. m.; Moorehead, Minn., 10th, 5 to 5.30 a. m.; Embarrass, Wis., 19th, p. m.; New Corydon, Ind., 20th, 2 a. m.; Vevay, Ind., 12th, 8 a. m., 13th, p. m.; Port Huron, Mich., 22d, 8.40 to 9.15 p. m.; Oswego, 2d, 7.45 to 8.15 p. m., 16th, 11.30 p. m., to midnight; Newport, R. I., 16th, 11 p. m., to a. m., of 17th; Auburn, N. H., 10th; Dexter, Me., 14th; Gardiner, Me., 27th, 11.30 p. m., to 3.30 a. m., of 28th.

Thunder Storms.—They were reported in the various districts as follows: New England, 9th, 15; Middle Atlantic states, 8th, 9th; South Atlantic states, 9th, 30th; East Gulf states, 2d, 6th, 8th, 11th, 12th, 20th, 30th; West Gulf states, 1st, 7th, 8th to 11th, 18th, 21st, 30th; Ohio valley and Tennessee, 8th, 9th, 16th, 17th, 18th, 30th; Lower Lake region, 5th, 14th; Upper Lake region, 16th, 30th; extreme Northwest, Ft. Stevenson, 13th, 17th; Upper Mississippi valley, 7th, 8th, 10th, 11th, 18th, 30th; Missouri valley, 7th, 10th, 11th, 17th, 18th; Southern slope, 1st, 2d, 10th, 11th; Middle slope, 10th, 11th, 17th; Southern plateau, Camp Thomas, Ariz., 9th; North Pacific coast region, Roseburg, 17th; Middle Pacific coast region, Red Bluff, 15th.

Zodiacal Light.—Nashville, Tenn., 2d, 13th, 14th, 19th, 20th, 25th, 26th, 27th, 28th, 29th; Chattanooga, 14th; Cresco, Ia., 19th; Cambridge, Mass., 11th, 14th, 15th, 20th, 25th, 26th; Somerset, Mass., 22d, 24th, 25th; Clear Creek, Neb., 18th to 24th; Wytheville, Va., 13th; New Corydon, Ind., 2d, 4th, 21st, 22d, 23d, 25th, 27th to 30th.

OPTICAL PHENOMENA.

Lunar halos have been observed in the various districts on the following dates: New England, 3d to 7th, 9th, 10th, 11th, 29th, 30th; Middle Atlantic states, 2d, 5th, 6th, 7th, 20th, 27th, 28th, 29th; South Atlantic states, 1st to 3d, 5th, 23d, 28th, 30th; East Gulf states, 1st to 5th, 9th, 28th; West Gulf states, 1st to 4th, 6th, 12th, 13th, 14th, 28th, 30th; Rio Grande valley, 2d, 3d, 13th; Ohio valley and Tennessee, 1st to 6th, 9th, 11th, 16th, 25th, 29th, 30th; Lower Lake region, 1st, 2d, 6th, 7th, 25th, 28th, 29th, 30th; Upper Lake region, 1st, 4th to 6th, 10th, 28th, 29th; extreme Northwest, 5th, 6th, 8th, 27th; Upper Mississippi valley, 1st, 4th, 5th, 6th, 9th, 10th, 18th, 27th, 28th, 29th; Missouri valley, 2d, 5th, 6th, 28th, 29th; Northern slope, 1st, 5th, 9th, 10th, 13th, 26th, 29th, 30th; Middle slope, 1st, 6th, 8th, 28th; Southern slope, 3d, 4th, 28th; Southern plateau, 2d, 3d, 5th, 6th, 27th; Middle plateau, 2d, 5th, 17th, 27th, 30th; Northern plateau, 8th, 14th, 26th, 29th, 30th; North Pacific coast region, 1st, 2d, 13th, 26th; Middle Pacific coast region, 5th, 26th, 29th; South Pacific coast region, 4th, 5th, 26th, 28th, 30th.

Solar halos have been observed in the various districts on the following dates: New England, 5th, 7th, 10th, 11th, 21st, 22d, 23d; Middle Atlantic states, 10th, 22d, 28th, 29th; East Gulf states, 10th, 14th, 29th; West Gulf states, Little Rock, 6th; Ohio valley and Tennessee, 6th, 8th to 11th, 17th, 22d to 25th, 29th; Lower Lake region, 6th, 9th, 10th, 11th, 23d, 25th; Upper Lake region, 13th, 20th, 21st, 26th; extreme Northwest, 15th to 18th, 23d; Upper Mississippi